Cobalt Digital Inc.

9032

Analog to Digital Converter with Frame Synchronization

Owner's Manual

9032-OM
Version: 2.0

9032 • HD/SD Analog to Digital Converter with Frame Sync Owner's Manual

- Cobalt Part Number: **9032-OM**
- Document Version: **2.0**
- Printed in the United States.
- Last Author: MB
- Printing Date: 03/05/08 12:55 PM

The information contained in this Owner's Manual is subject to change without notice or obligation.

Copyright

© 2008 Cobalt Digital Inc. All rights reserved.

Contents of this publication may not be reproduced in any form without the written permission of Cobalt Digital Inc. Reproduction or reverse engineering of copyrighted software is prohibited.

Notice

The material in this manual is furnished for informational use only. It is subject to change without notice and should not be construed as a commitment by Cobalt Digital Inc. Cobalt Digital Inc assumes no responsibility or liability for errors or inaccuracies that may appear in this manual.

Trademarks

- openGear is a registered trademark of Ross Video Limited.
- COBALT is a registered trademark of Cobalt Digital Inc.
- All other product names and any registered and unregistered trademarks mentioned in this manual are used for identification purposes only and remain the exclusive property of their respective owners.

Important Regulatory and Safety Notices

Before using this product and any associated equipment, refer to the "Important Safety Instructions" listed below so as to avoid personnel injury and to prevent product damage.

Products may require specific equipment, and /or installation procedures be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings

This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.

Warning

The symbol with the word **"Warning"** within the equipment manual indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

Caution

The symbol with the word "**Caution**" within the equipment manual indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Notice

The symbol with the word "**Notice**" within the equipment manual indicates a situation, which if not avoided, may result in major or minor equipment damage or a situation which could place the equipment in a non-compliant operating state.

ESD Susceptibility

This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.

Important Safety Instructions

Caution

This product is intended to be a component product of the openGear™ frame. Refer to the openGear™ frame Owner's Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as it's component products.

Warning

Certain parts of this equipment namely the power supply area still present a safety hazard, with the power switch in the OFF position. To avoid electrical shock, disconnect all A/C power cords from the chassis' rear appliance connectors before servicing this area.

Warning

Service barriers within this product are intended to protect the operator and service personnel from hazardous voltages. For continued safety, replace all barriers after any servicing.

This product contains safety critical parts, which if incorrectly replaced may present a risk of fire or electrical shock. Components contained within the product's power supplies and power supply area, are not intended to be customer serviced and should be returned to the factory for repair.

To reduce the risk of fire, replacement fuses must be the same type and rating.

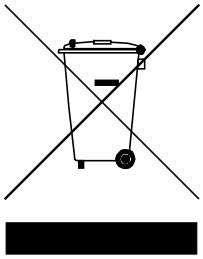
Only use attachments/accessories specified by the manufacturer.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Cobalt Digital encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Cobalt Digital for more information on the environmental performances of our products.

Contents

Introduction 6

In This Chapter....6
A Word of Thanks....6
Overview....6
Functional Block Diagram....7
Supported Audio and Video Formats....7
Input and Output Video....7
Documentation Terms....7

Installation and Setup 8

In This Chapter....8
Static Discharge....8
Unpacking....8
Rear Module Installation (Optional)....9
Rear Module Available for 9032....10
Board Installation....11
Software Version....11
Card Control and Status....12
Card Status....12
Menu Navigation....12
Menu Structure....12
Factory Default Settings....15

Remote Control 16

In This Chapter....16
DashBoard Control System Software....16

Technical Specifications 19

Service Information 21

In This Chapter....21
Troubleshooting Checklist....21
Warranty and Repair Policy....22

Ordering Information 23

9032 and Related Products....23

Contact Us 24

Contact Cobalt Digital Inc....24
Visit us at the Cobalt Digital Inc. website....24

Introduction

In This Chapter

This chapter includes the following sections:

- A Word of Thanks
- Overview
- Functional Block Diagram
- Supported Audio and Video Formats
- Documentation Terms

A Word of Thanks

Congratulations on choosing the openGear™ **9032 Analog to Digital Converter with Frame Sync**. The 9032 is part of a full line of modular conversion gear for broadcast TV environments. The Cobalt Digital openGear™ line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, and much more. Cobalt openGear™ modular conversion gear will meet your signal conversion needs now and well into the future.

Should you have questions pertaining to the installation or operation of your 9032, please contact us at the numbers listed on the back cover of this manual. We are happy to help with any questions regarding this or any other openGear™ card.

Overview

The 9032 is a high quality analog to digital converter that also includes a full video frame synchronizer.

The product also provides full color processing control of the output video, with separate controls for Luma Gain, Luma Lift, Chroma Saturation and Color Phase.

All card configuration is done with a simple front panel menu. There is a four character text display to view and control parameters, and a toggle switch and two buttons to navigate the menu. Card configuration can also be done over DashBoard remote control software.

The input and outputs of the 9032 are the following:

Input:

- One 3-BNC dual-rate HD/SD analog video input

Outputs:

- Two dual-rate HD/SD-SDI video outputs

Functional Block Diagram

The 9032 has a very flexible signal flow path and feature set that combines several products into one compact package. This section diagrams the basic signal flow of your 9032 product.

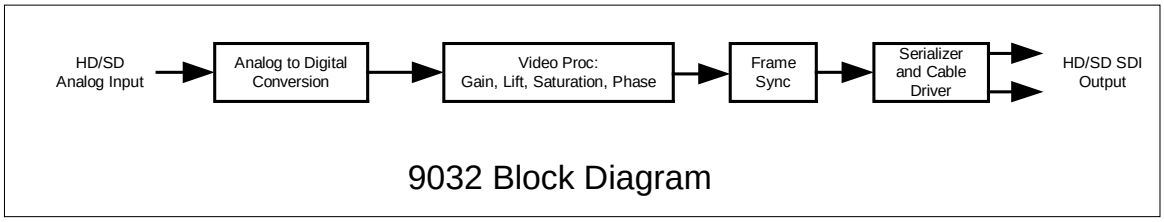


Figure 1. Simplified Block Diagram of 9032 Functions

Supported Audio and Video Formats

Input and Output Video

The 9032 supports the complete range of modern SMPTE standard SD and HD video formats.

Raster structure	Frame Rate
1080psF	23.98, 24
1080p	23.98, 24
1080i[1]	25, 29.97, 30
720p	25, 29.97, 30, 50, 59.94, 60
486i[1]	29.97
575i[1]	25

Notes:

1. All rates displayed as frame rates, interlaced ("i") field rates are two times the number shown.

Documentation Terms

The following terms are used throughout this guide:

- "**Frame**" refers to the **8310** frame that houses the **9032** card.
- "**Operator**" and "**User**" both refer to the person who uses the **9032**.
- "**Board**" and "**Card**" all refer to the **9032** card itself, including all components and switches.
- "**System**" and "**Video system**" refers to the mix of interconnected production and terminal equipment in which the **9032** operates.

Installation and Setup

In This Chapter

This chapter includes the following sections:

- Static Discharge
- Unpacking
- Rear Module Installation (Optional)
- Board Installation
- BNC Connections
- Menu Structure
- Factory Defaults

Static Discharge

Whenever handling the card and other related equipment, please observe all static discharge precautions as described in the following note:

ESD Susceptibility

Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments such as carpeted areas, and when wearing synthetic fiber clothing. Always exercise proper grounding precautions when working on circuit boards and related equipment.

Unpacking

Unpack each card you received from the shipping container, and check the contents against the packing list to ensure that all items are included. If any items are missing or damaged, contact your sales representative or Cobalt Digital directly.

Rear Module Installation (Optional)

If you are installing the card in a 8310-C-BNC or 8310-BNC frame (one with a 100 BNC rear module installed across the entire back plane), skip this section.

If you are installing the card into a slot with no rear module, you should have ordered and received one of the RM-9032-A module. You will need to install it in your 8310 frame before you can connect cables.

Use the following steps to install a rear module in an 8310 openGear™ frame:

1. Refer to the openGear™ 8310 frame Owner's Manual, to ensure that the frame is properly installed according to instructions.
2. On the rear of the 8310, locate the card frame slot.
3. As shown in Figure 2, seat the bottom of the rear module in the seating slot at the base of the frame's back plane.

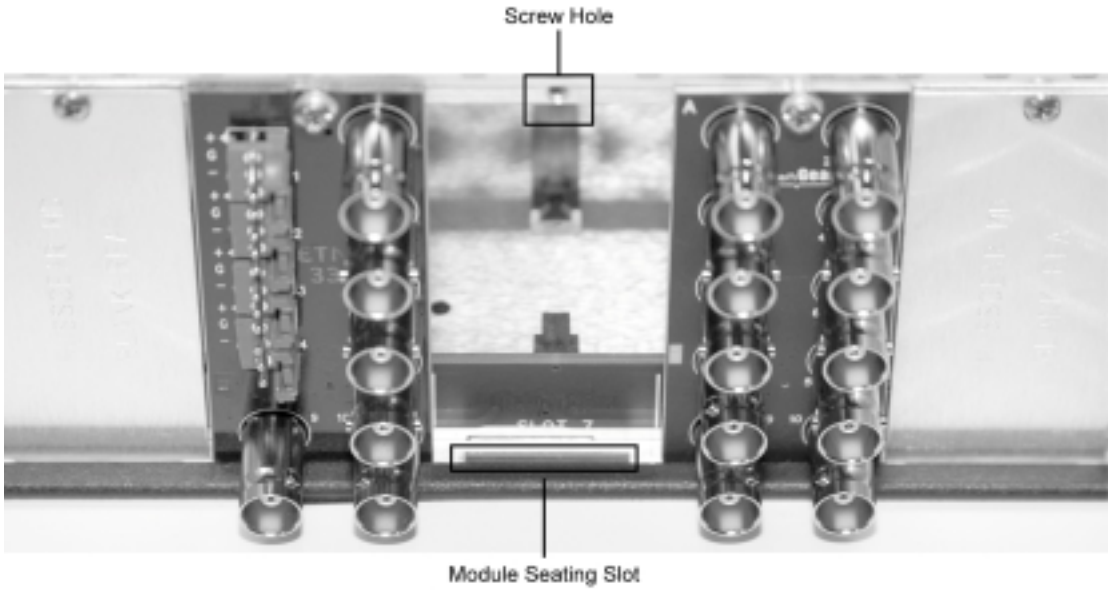


Figure 2. Rear Module Installation

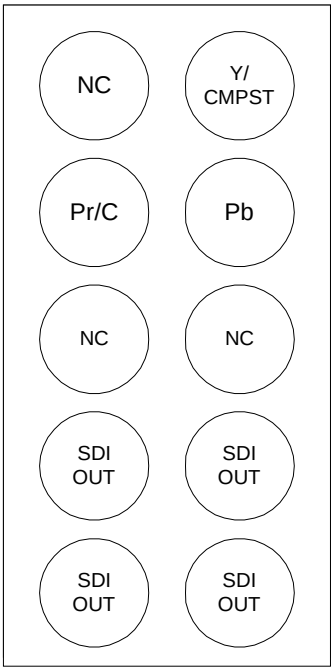
4. Align the top hole of the RM-9032-A with the screw hole on the top edge of the 8310 back plane.
5. Using a Phillips driver and the supplied screw, fasten the rear module to the 8310 back plane. Do not over tighten.

All modules are installed using the same method above.

The following section contains a drawing of the RM-9032-A module.

Rear Module Available for 9032

Figure 3. BNC Designations for the Card Rear Module available for the 9032.



RM-9032-A

Board Installation

Use the following steps to install the card in the openGear™ 8310 frame:

1. Refer to the Owner's Manual of the openGear™ 8310 frame to ensure that the frame is properly installed according to instructions.

Warning

Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using convection cooling.

2. After selecting the desired frame installation slot, hold the card by the edges and carefully align the card edges with the slots in the frame. Then, fully insert the card into the frame until the rear connection plugs are properly seated on the midplane and rear modules.

This completes the procedure for installing the card in the openGear™ 8310 frame.

Software Version

- This manual is written for software release number 2.0.
- To view the current software release number of your 9032 check the information submenu on the front edge controls or the card info menu in DashBoard.
- To upgrade your 9032 software, go to the download page at www.cobaltdigital.com to download the latest release, and upload the file through DashBoard (see DashBoard user manual, 3-5).

Card Control and Status

Card Status

The card indicates the status of the input signal with the four blue LEDs labeled with the different supported formats (1080, 720, 625, 525). When the card has locked to a particular input format, that LED will be illuminated. When the card has not locked to a particular video format, the card will search all possible formats, and the lights will cycle rapidly.

Menu Navigation

The card can be configured from a menu system built in to the front card edge. This provides an intuitive and easy to use method for exploring and using the features of the card.

The menu is navigated by using the toggle switch and the two push buttons. The lower button is the "Enter" button to enter a submenu, and the upper button is the "Exit" button to exit a submenu. Moving the toggle switch up or down moves up or down in menu choices, and pressing the buttons moves in or out of sub menus.

The menu LEDs will illuminate from top to bottom to indicate increasing depth in the menu.

Menu Structure

Video Submenu

Menu Structure			**Parameter Type**
Vid	Proc	Unty	Proc Unity
		Gain	Proc Gain
		Lift	Proc Lift
		Sat	Proc Sat
		Phas	Proc Phase
	Dec	SDIN	Decoder SD input
		HDIN	Decoder HD input
		PED	Pedestal - SD Setup
	Sorc		Set SDI or analog priority

Proc Unity

Resets all of the proc controls to unity value.

Proc Gain

This is Luma (Y channel) gain, expressed as a percentage. It ranges from 0.0% to 200.0% in 0.1% steps.

Proc Lift

This is Luma (Y channel) offset, expressed as an actual video value ranging from -1024 to 1024. If set to 0 no change is made. If set to 1024 absolute black (value 004) becomes absolute white (value 3FB). If set to –1024, absolute white becomes absolute black.

Proc Saturation

This is Chroma (C channel) gain, expressed as a percentage. It ranges from 0.0% to 200.0% in 0.1% steps.

Proc Phase

This is Chroma (C channel) phase adjustment, expressed in degrees, ranging from –360 to +360 in steps of one degree.

Decoder SD Input

Selects the input format for SD analog video. This must be changed to reflect the analog video format on the input for the 9033 to lock correctly. Valid SD formats are GBR, Component SMPTE, Component MII, Component Betacam, Component Y/C, and Composite.

Decoder HD Input

Selects the input format for HD analog video. The user must select between GBR and YPbPr for the 9033 to lock to the input correctly.

SD Pedestal (Setup)

Selects between 0 IRE and 7.5 IRE of setup (pedestal)on the input analog SD signal. This tells the card how much setup needs to be removed from the input.

Select Default Source SDI / Analog

Selects the input that has priority when both SDI and Analog inputs are detected.

Frame Sync Submenu

Menu Structure		**Parameter Type**
FS	Enbl	Frame Sync Enable
	HOS	Horizontal Offset
	VOS	Vertical Offset
	LATL	Line Latency
	LATF	Field Latency
	ADLY	Audio Delay
	RSET	Frame Sync Reset

Frame Sync Enable

Enables the frame sync. If disabled the output video timing matches the input video timing.

Horizontal Offset

Allows the user to specify an additional horizontal offset between the output video and the frame sync reference in sample clock periods. These are sample clocks in the reference format, not the output video format. For example, if using SD black burst to time 720p59.94 video each sample clock is 37ns, not 13.5ns.

Vertical Offset

Allows the user to specify an additional vertical offset between the output video and the frame sync reference in lines. These are lines in the reference format, not the output video format.

Frame Latency

Specifies the smallest amount of latency allowed by the frame sync. This latency measurement is in frames of the output video. The frame sync will not output a frame unless the specified number of frames are captured in the buffer. Minimum latency is three lines and zero frames in all video modes. The maximum latency is format dependent. The operational latency of the frame sync is always between the specified minimum latency and minimum latency plus one frame (not one field).

Audio Delay

Specifies the amount of additional audio delay after matching video delay. When the change is under one and a half frames, the change in audio delay will be applied without interrupting audio. When changing audio delay more than a frame and a half at a time, there will be a slight audio glitch.

Video Delay

Reports the current amount of video delay in ms.

Reset Frame Sync

Resets the frame sync, clearing any buffered audio and video. You must reset the framesync after manipulating the horizontal and vertical offset in order re-establish correct audio and video co-timing.

Display Submenu

Menu Structure		**Parameter Type**
Disp	H/V	Display Orientation
	BRGT	Display Brightness

Display Orientation

This parameter lets you change the orientation of the display. “Vert” makes the characters look correct when the cards are mounted in a 2 RU frame like the 8310. “Horz” makes the characters look right in a horizontal frame.

Display Brightness

This parameter allows you to set the standard output brightness of the menu display. It is a percentage of maximum brightness.

Preset Submenu

MENU STRUCTURE		**Parameter Type**
Prst	Slct	Select Preset
	Save	Save Settings
	Load	Load Settings
	Fact	Restore Factory Settings

Select Preset

Select from one of the five saved presets.

Save Settings

In this parameter, move the toggle switch up to save the settings to the card persistent storage.

Load Settings

In this parameter, move the toggle switch up to load the saved settings and make them active.

Restore Factory Settings

In this parameter, move the toggle switch up to make the factory default settings active, and make the stored settings equal to the factory settings.

Information Submenu

Menu Structure		**Parameter Type**
Info	+POW	Positive Watts Consumed
	-POW	Negative Watts Consumed
	SWR#	Software Release Number
	SWB#	Software Build Number

Positive Watts Consumed

A read only indication of power consumed by the card from the frames +12V rail.

Negative Watts Consumed

A read only indication of power consumed by the card from the frames +-7.5V rail.

Software Release Number

A read only indication of the software release number. A higher number is newer release of software.

Software Build Number

A read only indication of the software build number. Software build number is an internal indicator used by Cobalt engineers to differentiate different software builds.

Factory Default Settings

The factory default settings are as follows

1) The proc module is enabled, but all parameters are set to unity.
2) The Frame Sync is disabled, reference 1 or 2 must be chosen to enable the frame sync.

Remote Control

In This Chapter

This section provides a detailed explanation on using remote control functions with your card.

DashBoard Control System Software

The DashBoard Control System enables you to monitor and control openGear™ frames and controller cards from a computer. The DashBoard software and manual can be downloaded from the Cobalt Digital Inc. website (www.cobaltdigital.com).

Using the Menus and Menu Descriptions

You must first install the DashBoard Control System software on your computer. Refer to the ***DashBoard User Manual*** for software installation procedures and for using the DashBoard interface.

The following pages list the parameters from the menu tabs available in the DashBoard software when connected to a 9032.

Menu	Item	Format	Description
Card Info (Read-only)	Product	9032	The product name
	Manufacturer	Cobalt Digital Inc.	The manufacturer of the product
	Software Release Number	###	The release number of the firmware in this card
	Software Build Date	###	The internal build number of this software
	Software Build Time	###	The date and time the software was created
	+12 V Power Rail	#.## W	Positive Supply Power
	-7.5 Power Rail	#.## W	Negative Supply Power
	Video Input Standard	###########	Detected Video Standard on SDI or Analog Input
	Reference Standard	###########	Detected standard of selected reference.
	SSN	###########	Displays the Silicon Serial Number of the card.

Menu	Item	Format	Description
Frame Sync	Framesync Enable	On/Off	Enables the Frame Sync
	Horizontal Offset	0-4125 samples	Applies additional horizontal offset
	Vertical Offset	0-1124 lines	Applies additional vertical offset
	Minimum Latency Lines	3-1124 lines	Selects the minimum lines of latency allowed.
	Minimum Latency Fields	0-27	Selects the minimum fields of latency allowed.
	Framesync Status	On/Off/Error	Shows the status of the FS
	Reset Framesync	Confirm	Resets the FS and its buffers. Re-establishes audio video sync after a adjusting the horizontal and vertical offsets.

Menu	Item	Format	Description
Presets	Parameter Save	Confirm	Saves the parameters as preset.
	Parameter Load	Confirm	Loads parameters previously saved.
	Restart Parameters to Factory Default	Confirm	Will load factory presets and overwrite the save.

Menu	Item	Format	Description
Video Signal Controls	SD Input Type	Composite	Selects the format of input SD analog video, so the decoder can properly decode the signal.
		Y/C	
		YPbPr BetaCam	
		YPbPr MII	
		YPbPr SMPTE	
	HD Input Type	GBR	Selects the format of input HD analog video.
		YPbPr	
	SD Composite Contains	0.0 or 7.5 IRE of Setup	Specifies the amount of setup (pedestal) in the input video. It will be removed by the decoder.

Menu	Item	Format	Description
Video Proc	Video Gain	Range 0-2000	Gain applied to Y (Luma). 1000 is unity.
	Video Lift	Range (-999) – 999	Lift applied to Y (Luma), in 10 bit code value.
	Color Gain	Range 0-2000	Gain applied to C (Chroma). 1000 is unity.
	Color Phase	Range (–360) – 360	Phase of C (Chroma) in degrees.
	Reset to Unity	Confirm	Resets all of the proc controls to unity.

Technical Specifications

Table 4. Card - Technical Specifications

Category	Parameter	Specification
Analog Video Input	Number of Inputs	3
	Input Type	Differential, Common Mode Rejection (5V AC)
	Video Inputs	HD: Component YPbPr and RGB SD: Composite, Component YPbPr (BetaCam™, MII™, SMPTE/N10), RGB, and Y/C
	Conversion Bit Depth	12-Bits
	SD Color Separation	5-Line Adaptive Comb or Notch Filter
	Frequency Response	HD: Y- 0-30MHz ± 0.25db PbPr 0-15 MHz ± SD: Y- 0-30MHz ± 0.25db PbPr 0-15 MHz ±
	Differential Phase	SD: < ±0.4° typical
	Differential Gain	SD: < ±0.4% typical
	Noise	< -64dB (Luma Flat Field) < -61dB (Luma Ramp)
	Analog Front End Crosstalk	Within Noise Floor Measurement
	Return Loss	> 20dB to 30MHz
Serial Digital Video Outputs	Number of Outputs	2:HD/SD-SDI BNC per IEC 60169-8 Amendment 2
	Impedance	75Ω
	Return Loss	> 15 dB at 5MHz – 270MHz > 12 dB at 270MHz – 1.485GHz
	Signal Level	800 mV ±10%
	DC Offset	0 Volts ±50 mV
	Jitter	HD: < 0.15UI (all outputs) SD: <0.06UI (all outputs)
	Overshoot	<0.2% of amplitude

Category	Parameter	Specification
Reference Video Input	Number of Inputs	2 Terminating Frame Reference Inputs
	Standards Supported	HD: 720p 24/25/29.97/30/50/59.94 1080i 25/29.97 1080p 23.98/24/25/29.97/30 1080p/sF 23.98/24 SD: 486i 29.97 NTSC, 575i 25 PAL
	Signal Level	1Vp-p nominal
	Signal	Analog video sync (black burst or tri-level)
	Impedance	75Ω
	Return Loss	> 30dB to 30MHz
	Max DC on Ref Input	±1V

Other	Total Power Consumption	12W
	Warranty	Five Year Transferable

Specifications are subject to change without notice.

Service Information

In This Chapter

This chapter includes the following sections:

- Troubleshooting Checklist
- Warranty and Repair Policy

Troubleshooting Checklist

Routine maintenance to this openGear™ product is not required. In the event of problems with your card, the following basic troubleshooting checklist may help identify the source of the problem. If the module still does not appear to be working properly after checking all possible causes, please contact your openGear™ products distributor, or the Technical Support department at the numbers listed under the "Contact Us" section at the end of this manual.

1. **Visual Review —** Performing a quick visual check may reveal many problems, such as connectors not properly seated or loose cables. Check the module, the frame, and any associated peripheral equipment for signs of trouble.
2. **Power Check —** Check the power indicator LED on the distribution frame front panel for the presence of power. If the power LED is not illuminated, verify that the power cable is connected to a power source and that power is available at the power main. Confirm that the power supplies are fully seated in their slots. If the power LED is still not illuminated, replace the power supply with one that is verified to work.
3. **Reseat the Card in the Frame** — Eject the card and reinsert it in the frame.
4. **Check Control Settings —** Refer to the Installation and Operation sections of the manual and verify all user-adjustable component settings.
5. **Input Signal Status —** Verify that source equipment is operating correctly and that a valid signal is being supplied.
6. **Output Signal Path —** Verify that destination equipment is operating correctly and receiving a valid signal.
7. **Module Exchange** — Exchanging a suspect module with a module that is known to be working correctly is an efficient method for localizing problems to individual modules.
8. **Red Error Light –** If the red error light is illuminated, verify that the frame sync is set to the same reference that is being used on the back of the openGear™ frame (REF1 LOOP or REF2 LOOP), and that the reference is properly terminated.

Warranty and Repair Policy

The openGear™ card is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of FIVE (5) years from the date of shipment from our factory. In the event that your Cobalt Digital Inc. card proves to be defective in any way during this warranty period, Cobalt Digital Inc. reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this openGear™ card has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the FIVE (5) year warranty period.

In no event shall Cobalt Digital Inc. be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This openGear™ card Owner's Manual provides all pertinent information for the safe installation and operation of your Cobalt Digital Inc. Product. Cobalt Digital Inc. policy dictates that all repairs to the openGear™ card are to be conducted only by an authorized Cobalt Digital Inc. factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Cobalt Digital Inc. factory representative, will automatically void the warranty. Please contact Cobalt Digital Inc. Technical Support for more information.

In Case of Problems

Should any problem arise with your openGear™ card, please contact the Cobalt Digital Inc. Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your openGear™ card. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Cobalt Digital Inc. will be shipped collect.

The Cobalt Digital Inc. Technical Support Department will continue to provide advice on any product manufactured by Cobalt Digital Inc., beyond the warranty period without charge, for the life of the equipment.

Ordering Information

9032 and Related Products

Your **9032 HD/SD Analog to Digital Converter with Frame Sync** is a part of the openGear™ family of products. Cobalt Digital offers a full line of openGear™ terminal equipment including distribution, conversion, monitoring, synchronizers, encoders, decoders, embedders, and de-embedders, as well as analog audio and video products.

Standard Equipment

- **9032** HD/SD Analog to Digital Converter with Frame Sync
- **9032-OM** HD/SD Analog to Digital Converter with Frame Sync Owner's Manual

Optional Equipment

- **9032-OM** HD/SD Analog to Digital Converter with Frame Sync Owner's Manual (additional Owner's Manual)
- **RM-9032-A** openGear™ Rear Module compatible with 9032 (10 BNC connector)
- **8310-C** Digital Products Frame and Power Supply with Cooling Fans (2RU, holds 10 cards)
- **8310-C-BNC** Digital Products Frame and Power Supply with fixed 100-BNC Rear Module and Cooling Fans. (2RU, holds 10 cards)
- **MFC-8310-N** Network Controller Card (Additional)

Contact Us

Contact Cobalt Digital Inc.

PHONE	**General Business Office and Technical Support**	217.344.1243
	Fax	217.344.1245
E-MAIL	**General Information**	Info@cobaltdigital.com
	Sales Information	Sales@cobaltdigital.com
POSTAL SERVICE	**Cobalt Digital Inc.**	2406 East University Avenue Urbana, IL 61802 USA

Visit us at the Cobalt Digital Inc. website.

http://www.cobaltdigital.com

- Online catalog
- Related products and full product lines
- Trade show information
- Dealer information
- Cobalt Digital Inc. news